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Building a Real-Time, Multi-Channel Spectrometer¹

FELIX H. YU, Harvard College, GUNSU S. YUN, PAUL M. BELLAN, Caltech — The design and fabrication of a real-time, multi-channel spectrometer will be presented. This spectrometer will incorporate a 76-pin photodiode array and amplifying circuit detector with a 0.22m monochromator. Initial calculations suggest rise/fall times of ~ 90 ns (zero to 90%) will be sufficient to observe plasma dynamics with a 1 microsecond timescale; this high-speed response time is addressed with appropriate optimized circuitry. Moreover, characteristic photodiode responsivity and estimated plasma power output indicate peak photodiode signals will be on the order of 2 mA, and hence proper low-noise amplification will allow its application in tracking time-evolution of spectral data over a wide level of signal strength. In addition, this spectrometer will feature a wide-bandwidth (~ 40 nm) spectral window.

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